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Claim Listing

1–28. (cancelled)

29. (new) A method for controlling the moisture profile or moisture gradient in production of an uncoated paper web of at least SC quality, having a cross direction, a running direction and a thickness direction, comprising the steps of:

pre-moisturizing, with a pre-moisturizer, the paper web in the cross direction substantially across the entire width of the web from an initial moisture content before pre-moisturizing to a selected pre-moisture content;

passing the pre-moisturized paper web through a multi-nip calender having at least a first roll stack and a last roll stack, each roll stack having at least three rolls, and wherein the multi-nip calender is situated before a slitter-winder of the web;

intermediate-moisturizing the web, with an intermediate-moisturizer, in the cross direction substantially across the entire width of the web before the last roll stack and after a first calendering nip of the first roll stack to a selected intermediate moisture content;

drying the web in the last roll stack to a selected final moisture value;

continuously controlling the moisture profile or moisture gradient of the web in the thickness-direction in the multi-nip calender by adjusting the pre-moisturizing of the web, based on the selected final moisture value of the web.

30. (new) The method of claim 29, wherein the pre-moisturizer is controlled by the final moisture value of the web as measured after the the last roll stack.

31. (new) The method of claim 29 wherein the intermediate moisturizer is controlled by the final moisture value of the web as measured after the the last roll stack.

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32. (new) The method of claim 29 wherein the pre-moisturizer or the intermediate moisturizer is controlled automatically.

33. (new) The method of claim 29 wherein a final moisture value is calculated from the selected pre-moisture value of the web and from evaporation of moisture that has occurred in each roll stack; and the intermediate moisturizing of the web is carried out by the intermediate moisturizer of the web.

34. (new) The method of claim 29 wherein evaporations from each roll and the additional or intermediate moisturizing of the web form a subtotal, and that said subtotal and the pre-moisture value of the web are passed as separate variables through a coupling means to serve as a control parameter of the pre-moisturizer.

35. (new) The method of claim 29 wherein the final moisture value which has been either measured, or calculated in a coupling means, is passed by means of the coupling means to serve as a control parameter of the pre-moisturizer.

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36. (new) A system for controlling a moisture profile or moisture gradient of a paper web and for producing a high-quality and uncoated paper web of at least SC-quality having a width defined in a cross direction, the paper web having a running direction, a thickness direction, a pre-moisture value, and a final moisture value, the system comprising:

a multi-nip calender followed by a slitter-winder, the multi-nip calender having at least a first roll stack having at least three rolls, and a last roll stack having at least three rolls;

a pre-moisturizer controllable by a first control parameter, the pre-moisturizer situated before the multi-nip calender, the pre-moisturizer arranged to apply moisture to the paper web substantially across the paper web's entire width in the cross direction, transverse to the running direction;

an intermediate moisturizer controllable by a second control parameter arranged before the last roll stack and after a first calendering nip of the first roll stack to moisturize the web in the cross direction substantially across its entire width before the last roll stack;

a coupling means for continuously controlling in the thickness-direction, the moisture profile or moisture gradient of the web in the multi-nip calender by controlling the first control parameter of the pre-moisturizer, which control parameter corresponds to the final moisture value of the web.

37. (new) The system of claim 36 wherein the final moisture value of the web is the first control parameter.

38. (new) The system of claim 37 wherein the coupling means further comprises means for continuously controlling in the thickness-direction, the moisture profile or moisture gradient of the web in the multi-nip calender by controlling the second control parameter and wherein the final moisture value of the web is the second control parameter.

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39. (new) The system of claim 38 wherein the pre-moisturizer or the intermediate moisturizer is controllable automatically.

40. (new) The system of claim 36 further comprising a moisture meter situated after the multi-calender in communication with the coupling means, wherein the final moisture value of the web is the control parameter of the pre-moisturizer.

41. (new) The system of claim 36 wherein a first variable, and a second separate variable, are passed to the coupling means to provide the first control parameter, the first variable being a sum of evaporation from the paper web on each roll of the multi-roll calender and the intermediate moisturizing of the web, and the second separate variable is the pre-moisture value of the web.

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42. (new) A method of making an uncoated paper web of at least SC quality, the web having a cross direction, a running direction and a thickness direction, the method comprising the steps of:

forming a paper web having a basis weight of 30 to 80 g/m^2, and a filler content of 15% to 40%;

passing the paper web to a multi-nip calender having a first roll stack which has at least three rolls, and a second roll stack which has at least three rolls;

before passing the paper web to the multi-nip calender, using a pre-moisturizer to pre-moisturize the paper web in the cross direction substantially across the entire width of the web;

passing the paper web through a first calendering nip of the multi-nip calender after the pre-moisturizer;

after the web has passed through the first calendering nip, moisturizing the web with an intermediate-moisturizer in the cross direction substantially across the entire width of the web, said moisturizing step taking place before the web has passed to the second roll stack;

drying the web in the second roll stack to a selected final moisture value; and

continuously controlling the moisture profile or moisture gradient of the web in the thickness-direction in the multi-nip calender by adjusting the pre-moisturizing of the web, based on the selected final moisture value of the web.

43. (new) The method of claim 42, wherein the final moisture value of the web is measured after the second roll stack.

44. (new) The method of claim 42 further comprising the step of continuously controlling the moisture profile or moisture gradient of the web in the thickness-direction, in the multi-nip calender by adjusting the intermediate moisturizing of the web, based on the selected final moisture value of the web.

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45. (new) The method of claim 42 wherein a final moisture value is calculated from a moisture value of the web after pre-moisturizing, minus the evaporation of moisture that has occurred in the first roll stack, plus moisture addition by intermediate moisturizing of the web minus the evaporation of moisture that has occurred in the second roll stack.

46. (new) The method of claim 45 wherein evaporations from each roll and the additional moisture added by intermediate moisturizing of the web form a subtotal, and that said subtotal and the pre-moisture value of the web are passed as separate variables through a coupling means to serve as control parameters for controlling the moisture profile or moisture gradient of the web in the thickness-direction in the multi-nip calender by adjusting the pre-moisturizing of the web.

47. (new) The method of claim 42 wherein each roll of the multi-nip calender has a center line passing through an axis of said roll.

48. (new) The method of claim 47 wherein the axes of each roll of the multi-roll calender lie in the same plane

49. (new) The method of claim 42 wherein the first stack has a number of rolls which is an odd integer whose value is at least 3.

50. (new) The method of claim 42 wherein the second stack has a number of rolls which is an odd integer whose value is at least 3.

51. (new) The method of claim 42 wherein the number of the rolls in the first roll stack is odd and in which an elastic backing roll and a hard press roll are placed alternately one after the other.

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52. (new) The method of claim 42 wherein the number of the rolls in the second roll stack is odd and in which an elastic backing roll and a hard press roll are placed alternately one after the other.

53. (new) The process of claim 42 wherein the paper web is made from a pulp that contains mechanical pulp and chemical pulp, and has a range of roughness of between 0.8 and 2.0 μm, and an average Hunter gloss of the paper web, taken as an average value of an upper and a lower surface of the web, of greater than 45%.

54. (new) The process of claim 42 wherein the paper web is made from a pulp that contains mechanical pulp and chemical pulp, and has a range of roughness of between 0.8 and 2.0 μm, and an average Hunter gloss of the paper web, taken as an average value of an upper and a lower surface of the web, of greater than 55%.

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55. (new) A uncoated paper web of at least SC quality, the web having a cross direction, a running direction and a thickness direction, the web being formed in the process having the following steps:

forming a paper web having a basis weight of 30 to 80 g/m^2, and a filler content of 15% to 40%;

passing the paper web to a multi-nip calender having a first roll stack which has at least three rolls, and a second roll stack which has at least three rolls;

before passing the paper web to the multi-nip calender, using a pre-moisturizer to pre-moisturize the paper web in the cross direction substantially across the entire width of the web;

passing the paper web through a first calendering nip of the multi-nip calender after the pre-moisturizer;

after the web has passed through the first calendering nip, moisturizing the web with an intermediate-moisturizer in the cross direction substantially across the entire width of the web, said moisturizing step taking place before the web has passed to the second roll stack;

drying the web in the second roll stack to a selected final moisture value; and

continuously controlling the moisture profile or moisture gradient of the web in the thickness-direction in the multi-nip calender by adjusting the pre-moisturizing of the web, based on the selected final moisture value of the web, wherein the paper web is made from a pulp that contains mechanical pulp and chemical pulp, and has a range of roughness of between 0.8 and 2.0 μm, and an average Hunter gloss of the paper web, taken as an average value of an upper and a lower surface of the web, of greater than 45%.

56. (new) The paper web of claim 55 wherein the average Hunter gloss of the paper web, taken as an average value of an upper and lower surface of the web is greater than 55 %.